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FORM PTO-1390 (REV 10-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER P/1228-153
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 10/089639
INTERNATIONAL APPLICATION NO. PCT/SE00/01876	INTERNATIONAL FILING DATE 28 September 2000	PRIORITY DATE CLAIMED 29 September 1999	
TITLE OF INVENTION REAR AXLE ARRANGEMENT FOR A HEAVY VEHICLE			
APPLICANT(S) FOR DO/EO/US Ake BERGSTROM et al			

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

- ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
- ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
- ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
- ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
- ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - ☐ is attached hereto (required only if not communicated by the International Bureau).
 - ☒ has been communicated by the International Bureau.
 - ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
- ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
- ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - ☐ are attached hereto (required only if not communicated by the International Bureau).
 - ☐ have been communicated by the International Bureau.
 - ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - ☒ have not been made and will not be made.
- ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
- ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
- ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern document(s) or information included:

- ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
- ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
- ☒ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
- ☐ A substitute specification.
- ☐ A change of power of attorney and/or address letter.
- ☒ Other items or information:
Print EFS Form
Intl. Search Report
& 1 reference
4 Drawing Sheets (Figs. 1-4)
Intl. Prelim. Exam. Report

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addresses (mail label **EL924372540US** in an envelope addressed to: **U.S. Patent and Trademark Office, P.O. Box 2327, Arlington, VA 22202 on March 29, 2002**

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Signature

March 29, 2002
Date of Signature

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Form PTO-1390 (REV 10-2000) page 2 of 2

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P/1228-153

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

Åke BERGSTRÖM, et al.

Date: March 29, 2002

Serial No.: not yet known

Group Art Unit: not yet known

Filed: herewith

Examiner: not yet known

For: REAR AXLE ARRANGEMENT FOR A HEAVY VEHICLE

U.S. Patent and Trademark Office

P.O. Box 2327

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PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows.

FEE CALCULATION

Any additional fee required has been calculated as follows:

_____ If checked, "Small Entity" status is claimed.

	NO. CLAIMS AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR		EXTRA PRESENT		RATE	ADDIT. FEE
TOTAL	17	MINUS	20	* =	0	X	(\$9 SE or \$18)	\$0
INDEP.	1	MINUS	3	** =	0	X	(\$42 SE or \$84)	\$0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM						X	(\$140 SE or \$280)	\$0
								TOTAL \$0

* not less than 20 ** not less than 3

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

CONTINGENT EXTENSION REQUEST

If this communication is filed after the shortened statutory time period had elapsed and no separate Petition is enclosed, the Commissioner of Patents and Trademarks is petitioned, under 37 C.F.R. § 1.136(a), to extend the time for filing a response to the outstanding Office Action by the number of months which will avoid abandonment under 37 C.F.R. § 1.135. The fee under 37 C.F.R. § 1.17 should be charged to our Deposit Account No. 15-0700.

AMENDMENTS

 X If checked, amendments to the specification and claims are submitted herewith.

1. X If checked, an abstract is submitted as the last page of Appendix A.

2. Specification:

Please delete the paragraph(s)/section(s) beginning at page 1, line 5 to page 1, line 6, and replace such paragraph(s)/section(s) pursuant to 37 C.F.R. § 1.121(b)(ii) with the “clean” version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(b)(iii) is attached hereto as Appendix B.

3. Claims:

Please cancel claims 1-16 without prejudice.

Please add new claims 17-33 pursuant to 37 C.F.R. § 1.121(c)(i) as set forth in the “clean” version attached hereto as Appendix A. Entry is respectfully requested. A version with markings to show the changes made pursuant to 37 C.F.R. § 1.121(c)(ii) is attached hereto as Appendix B.

REMARKS/ARGUMENT

The original claims have been replaced with claims in better form for U.S. practice. The original claims have not been narrowed by this Amendment, but rather have been restated in U.S. form.

The replacement claims eliminate multiple dependent claims for reducing the official filing fee.

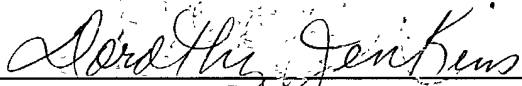
Minor specification amendments are made.

EXPRESS MAIL CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as Express Mail to Addressee (mail label # EL924372540US) in an envelope addressed to: U.S. Patent and Trademark Office, P.O. Box 2327, Arlington, VA 22202, on March 29, 2002

Dorothy Jenkins

Name of Person Mailing Correspondence



Signature

March 29, 2002

Date of Signature

Respectfully submitted,



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APPENDIX A
“CLEAN” VERSION OF EACH PARAGRAPH/SECTION/CLAIM
37 C.F.R. § 1.121(b)(ii) AND (c)(i)

SPECIFICATION:

Paragraph at page 1, line 5 to page 1, line 6:

The present invention relates to a rear axle arrangement for a heavy vehicle and particularly to a frame of the arrangement and its connection to the vehicle chassis.

CLAIMS (with indication of amended or new):

New 17. A rear axle arrangement for a heavy vehicle, wherein the vehicle includes an elongated chassis element which extends in a longitudinal direction of the vehicle from front to rear;

the rear axle arrangement includes at least one separate rear axle unit, the rear axle unit including a load bearing frame and two wheels respectively at lateral sides of the rear axle arrangement;

the frame having a forward end region and a rearward end region in the longitudinal direction of the vehicle, the forward end region of the frame being adapted to connect to the chassis element; and

the two wheels of the rear axle unit are suspended on the frame.

New 18. The rear axle arrangement of claim 17, wherein the frame is shaped to define a space which extends through the frame structure in the longitudinal direction of the vehicle.

New 19. The rear axle arrangement of claim 18, wherein to define the space, the frame includes first and second lateral side portions which are spaced apart from each other, are upstanding and extend in the longitudinal direction of the chassis element; an upper portion connecting the side portions; and a lower portion below the upper portion and also connecting the side portions wherein the side portions, upper portion and lower portion together surround and define the space.

New 22. The rear axle arrangement of claim 19, wherein there are two of the lower portions connecting the side portions, with a first one of the lower portions adjacent to the front end region of the frame structure and the second lower portion adjacent to the rear end region of the frame.

New 24. The rear axle arrangement of claim 23, wherein the respective individual suspension for each of the two wheels comprises a lower link arm and an upper link arm which is above the lower link arm and connected to the wheel, and the lower and upper link arms both being pivotally connected to the frame.

New 26. The rear axle arrangement of claim 24, wherein the rear axle unit further comprises a respective spring for each of the wheels, and the spring is connected between the upper portion of the frame and the respective lower link arm for the wheel.

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APPENDIX B
VERSION WITH MARKINGS TO SHOW CHANGES MADE
37 C.F.R. § 1.121(b)(iii) AND (c)(ii)

SPECIFICATION:

Paragraph at page 1, line 5 to page 1, line 6:

The present invention relates to a rear axle arrangement for a heavy vehicle and particularly to a frame of the arrangement and its connection to the vehicle chassis [according to the preamble to patent claim 1].

ABSTRACT:

The invention relates to a rear axle arrangement [(12)] for a heavy vehicle, e.g. a freight vehicle. The vehicle incorporates a number of wheels which bear the vehicle and an elongate chassis element which extends in the longitudinal direction of the vehicle. The rear axle arrangement [(12)] incorporates at least one separate rear axle unit [(13)] which includes a loadbearing frame structure [(14)] and two of said wheels. The frame structure [(14)] extends between a first end region and a second end region in the longitudinal direction of the vehicle and the first end region of the frame structure [(14)] is designed to be connected to the elongate chassis element. In addition, the two wheels are suspended on the frame structure [(14)].

Rear axle arrangement for a heavy vehicle**BACKGROUND TO THE INVENTION, AND STATE OF THE ART**

- 5 The present invention relates to a rear axle arrangement for a heavy vehicle according to the preamble to patent claim 1.

Heavy vehicles, which here means, for example, trucks, buses and similar freight and utility vehicles, incorporate according to conventional technology a longitudinal
10 chassis element in the form of two frame side members which are connected to one another by means of a number of cross-members. The frame side members extend parallel with one another along substantially the whole length of the vehicle and support vehicle components such as the engine, the driver's cab and a load surface which takes the form, for example, of a load platform or a superstructure. In addition,
15 the vehicle's front and rear axles are suspended in the frame side members.

In heavy vehicles such as trucks, the frame side members and the cross-members act as main loadbearing parts of the vehicle in order to achieve strength and rigidity. In heavy vehicles such as buses, the bodywork also contributes to vehicle rigidity and
20 strength. Conventionally designed support devices are nevertheless built so as to be relatively unresistant to bending and torsion in order to be able to cope with heavy loads and varying road conditions, comprising a complete range from forest roads or no roads to smooth motorways. Relatively low resistance to bending and torsion does entail, however, certain problems with regard to riding comfort and vehicle running
25 characteristics. The chassis element having relatively low resistance to torsion and the wheel axles being made of steel result in not entirely satisfactory riding comfort, particularly on long journeys and on good roads. Nor is it possible for riding comfort and vehicle running characteristics to be improved to any appreciable extent by more sophisticated suspension systems. As heavy vehicles are to an ever increasing extent
30 travelling on smooth roads, riding comfort and vehicle running characteristics are an increasingly important factor. In addition to riding comfort being naturally advantageous for the vehicle's driver and passengers, it is also important to reduce the amount of damage to freight, particularly when carrying goods which are easily

damaged. Conventional frame side members and steel wheel axles result in any road surface unevenness being propagated in the chassis element and having adverse effects on substantially the whole vehicle.

- 5 The conventional superstructure of a heavy vehicle also has the disadvantage of its manufacture being relatively expensive because such a design involves many different components which cannot be standardised for different vehicle variants. For example, the vehicle's front and rear axle arrangements may involve many different components depending on whether the respective wheels are to be steerable or not, 10 powered or not, how many rear axles the vehicle is to have, the type of suspension, etc. Such a conventionally constructed heavy vehicle also requires a relatively large amount of assembly work.

- DE-A-4322716 describes a vehicle chassis for heavy-duty vehicles. The chassis 15 incorporates a rear axle arrangement, a box-like central chassis element and a front axle arrangement. The rear and front axle arrangements are of conventional design in that they incorporate two longitudinal frame members which are connected to one another by means of cross-members. The wheel suspension seems to incorporate a steel wheel axle and the forces acting upon the wheels will be led on into the central 20 tunnel-like chassis element.

SUMMARY OF THE INVENTION

- The object of the present invention is to provide a rear axle arrangement which 25 constitutes a substantially self-supporting unit, i.e. which can absorb the forces acting upon the rear wheels and which contributes to better vehicle running characteristics.

- A further object of the present invention is to provide a rear axle arrangement which 30 incorporates simple standardised components which are easy to fit and readily available, so that repair work and servicing operations can be performed easily and quickly.

These objects are achieved with the rear axle arrangement indicated in the introduction, which is characterised in that the rear axle arrangement incorporates at least one separate rear axle unit which itself incorporates a loadbearing frame structure and two of said wheels, said frame structure extends between a first end region and a
5 second end region in said longitudinal direction and said first end region of said frame structure is designed to be connected to said elongate chassis element, and that said two wheels are suspended on said frame structure.

The rear axle arrangement thus incorporates a separate unit which includes a frame
10 structure, i.e. a framelike structure, on which two rear wheels are suspended. For major repair work, the rear axle unit can easily be disassembled from the elongate chassis element and be replaced by another rear axle element, thus avoiding the vehicle being stationary in a workshop. Replacing one rear axle unit by another is a simple operation and need not take up valuable time.

15 According to a further embodiment of the invention, said frame structure forms a space which extends through the frame structure in said longitudinal direction. The framelike structure thus exhibits a cavity which extends in the longitudinal direction of the vehicle.

20 According to a further embodiment of the invention, the frame structure incorporates two side portions which are situated at a distance from one another, extend in said longitudinal direction and are connected to one another by means of an upper portion and by means of at least one lower portion in such a way that said portions form said
25 space between them. The result is a tunnel-like structure or may be likened to a boxlike structure which is open at both of its ends arranged in the longitudinal direction of the vehicle, extends in the longitudinal direction of the vehicle and is capable of absorbing at least substantially all the vertical forces which act upon the rear wheels.

30 According to a further embodiment of the invention, said portions, as viewed in the longitudinal direction of the vehicle, form a substantially quadrilateral frame round said space. The result is a frame structure which has high rigidity and strength.

According to a further embodiment of the invention, each side portion has a lower section and an upper section, and each of the lower sections is of greater extent in said longitudinal direction than the respective upper section. In addition, said side portions
5 may be connected to one another by two lower portions, in which case the first lower portion is arranged adjacent to the first end region of the frame structure and the second lower portion is arranged adjacent to the second end region of the frame structure. Said positioning of the lower portions results in a frame structure which has high rigidity and strength.

10 According to a further embodiment of the invention, said two wheels are individually suspended in said frame structure. This improves the vehicle's riding comfort and running characteristics in that vertical forces acting upon a rear wheel of the vehicle will be absorbed by the frame structure and will not affect other parts of the vehicle.

15 According to a preferred embodiment of the invention, each of said two wheels is suspended by means of a lower link arm and an upper link arm which are pivotingly connected to the frame structure. In addition, both the lower link arms and the upper link arms are pivotingly connected to respective said side portion. The rear axle unit also incorporates a spring device for each wheel, and each spring device is connected
20 to the upper portion of the frame structure and a lower link arm.

According to a further embodiment of the invention, said rear axle unit forms a substantially self-supporting rear axle module, and any desired number, preferably two or three, of such rear axle modules may be connected to one another via said frame
25 structures. The rear axle unit thus forms a self-supporting module. One rear axle arrangement can only incorporate one such module, but it is also possible to connect two or more such modules, in which case each module is self-supporting.

30 According to a further embodiment of the invention, said wheels are powered and a differential gear is arranged in said frame structure. With advantage, said differential gear is arranged in said space, in which case not only does each of said side portions incorporate an aperture but a respective driveshaft also extends from the respective wheel through said aperture to said differential gear. Said space extending through the

frame structure in the longitudinal direction of the vehicle, i.e. the frame structure forming a hollow structure in the longitudinal direction of the vehicle, makes it easy for the differential gear to be arranged and fitted in said frame structure, either from the first end region of the frame structure or from the second end region of the frame structure, before the first end region of the rear axle unit is connected to the elongate chassis element of the vehicle. Situating the differential gear in said space provides a flexible and compact solution. The differential gear is itself connected to the vehicle's engine via a gearbox and a driveshaft. The gearbox and driveshaft are situated in the vehicle's elongate chassis element in the vicinity of said frame structure.

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According to a further embodiment of the invention, said rear axle unit incorporates a towbar which is directly connected to said frame structure. The towbar, which is designed to make it possible to attach trailer vehicles to said vehicle, is thus directly connected to the rear axle unit, thereby avoiding multi-stage power transmission. This is possible because the frame structure of the rear axle unit is so constructed as to exhibit high rigidity and strength.

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According to a further embodiment of the invention, said rear axle unit incorporates a coupling device for attaching a trailer vehicle. Thus, like the towbar, said coupling device is also designed to make it possible to attach a trailer. What is referred to here, however, is a coupling device in the form of a turntable which is designed to make it possible to attach trailers which only have a rear axle arrangement. According to a preferred embodiment, said coupling device constitutes said upper portion which connects the side portions of the frame structure.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be explained on the basis of embodiments described
5 by way of examples with reference to the attached drawings.

Fig. 1 shows a perspective view of a heavy vehicle.

Fig. 2 shows a perspective view of a rear axle arrangement incorporating two rear
axle units.

10 Fig. 3 shows a perspective view of a frame structure of a rear axle arrangement
according to the invention.

Fig. 4 shows a perspective view of a frame structure of a rear axle arrangement
according to the invention.

15 **DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION**

Fig. 1 depicts schematically a heavy vehicle 1 in the form of a truck which
incorporates a load surface 2 which consists of a corrugated metal sheet 3 and panels
4 arranged on the metal sheet 3. Although the invention will be described below in
20 connection with a truck, it should be noted that the invention is also applicable to
other types of heavy vehicle, e.g. buses.

The vehicle 1 incorporates an elongate chassis element 5 which extends in the
longitudinal direction x of the vehicle 1. As may be seen in Fig. 1, said elongate
25 chassis element 5 is hollow and incorporates four walls 6, 7, 8, 9 which extend along
the whole length of the chassis element 5. The walls 6, 7, 8, 9, as viewed in the
longitudinal direction x of the vehicle 1, form a substantially quadrilateral frame
round said hollow. The walls 6, 7, 8, 9 are made of relatively thin sheetmetal and the
chassis element 5 incorporates a number of support frames 10 which have a central
30 aperture and are distributed along the length of the chassis element 5. Fig. 1 shows
only one such support frame 10. On each side of the chassis element 5, outside each
support frame 10, there is a support device 11 which is connected to the support

frames 10 by means of bolts running through (not depicted). The corrugated metal sheet 3 and the panels 4 rest on the chassis element 5 and the support devices 11.

The present invention relates to the rear axle arrangement of the vehicle 1 and Fig. 2 depicts an embodiment of a rear axle arrangement which is designed to be connected to the vehicle's chassis element 5.

As indicated in Fig. 2, the rear axle arrangement 12 incorporates in this embodiment two rear axle units 13 which are directly connected to one another, e.g. by bolts running through (not depicted). Each rear axle unit 13 forms a self-supporting module. It should be noted that the rear axle arrangement 12 may incorporate any desired number of modules, i.e. rear axle units 13, preferably one, two or three, and if the rear axle arrangement incorporates two or more rear axle units these rear axle units may be connected directly to one another. Each rear axle unit 13 incorporates a frame structure 14 and two wheels (not depicted, although one of the wheels of each rear axle unit is depicted in Fig. 1, with reference notation 25) which are suspended on the frame structure 14.

As better indicated in Fig. 3, the frame structure 14 has a first end region 15 designed to be connected to the chassis element 5 of the vehicle 1, and a second end region 16. The frame structure 14 forms a space 17 which extends from the first end region 15 to the second end region 16 in the vehicle's longitudinal direction x. The space 17 is surrounded by two side portions 18, 19, an upper portion 20 and two lower portions 21, 22. All the portions 18, 19, 20, 21, 22 preferably incorporate aluminium castings with a view to achieving a lightweight frame structure.

The portions 18, 19, 20, 21, 22 form, as viewed in the longitudinal direction x of the vehicle 1, a substantially quadrilateral frame round the space 17. As mentioned previously, the walls 6, 7, 8, 9 of the chassis element 5, as viewed in the longitudinal direction x of the vehicle 1, form a substantially quadrilateral frame round said hollow which extends along the whole length of the chassis element 5. Adapting the lengths of the portions 18, 19, 20, 21, 22 to the transverse lengths of the walls 6, 7, 8, 9 enables the frame structure 14 to be connected to the chassis element 5 by the first end

region 15 of the frame structure 14 being inserted a short distance into said chassis element 5 so that the walls 6, 7, 8, 9 of the chassis element 5 abut to a corresponding extent against the portions 18, 19, 20 and possibly the portion 21 of the frame structure 14 and a number of bolts can extend through said walls 6, 7, 8, 9 of the chassis element 5 into the portions 18, 19, 20 and possibly the portion 21 of the frame structure 14 and connect the frame structure 14 to the chassis element 5.

As indicated in Fig. 3, each side portion 18, 19 has a lower section 23 and an upper section 24. In addition, the lower sections 23 of the side portions 18, 19 are of greater extent in the longitudinal direction x than the upper section 24, i.e. the side portions 18, 19 narrow from the lower section 23 to the upper section 24, where they are connected to the upper portion 20. The first lower portion 21 is arranged adjacent to the first end region 15 of the frame structure 14, and the second portion 22 is arranged adjacent to the second end region 16 of the frame structure 14.

As previously mentioned, each rear axle unit 13 incorporates two wheels 25 depicted in Fig. 1. Fig. 2 omits the wheels 25 so that their suspension is depicted more clearly. Fig. 2 shows only the wheel hub 26 to which the wheel 25 is intended to be fitted. The wheel hubs 26 incorporate in a conventional manner brake discs, brake pads and other equipment for the braking of the vehicle 1. These components will not be described in more detail. References hereinafter to the wheels 25 include also wheel hubs, brake discs, brake pads etc. Each wheel 25 is individually suspended in the frame structure 14 of each rear axle unit 13. Each suspension incorporates a lower link arm 27 and an upper link arm 28. Each of the lower link arms 27 is pivotingly connected to a respective side portion 18, 19 in the vicinity of the lower section 23 of the respective side portion 18, 19 and to a respective wheel 25. Each of the upper link arms 28 is pivotingly connected to the respective side portion 18, 19 via a fastening device 29, and to a respective wheel 25. Each suspension also incorporates a spring device 30 which is connected to a respective end of the upper portion 20 via a fastening device 29 and a respective lower link arm 27. Each spring device 30 incorporates a spring function and a shock-absorber function. The wheels 25 of each rear axle unit 13 are thus suspended entirely individually, which means that road surface unevenness with respect to one of these four wheels 25 results only in

movement of that wheel 25 and not of the other wheels 25 of the rear axle units 13. The vertical forces arising from such unevenness will be absorbed by the respective frame structure of the rear axle unit 13.

- 5 As may be seen in Fig. 2, the wheels 25 of each rear axle unit 13 are powered. A differential gear 31 is arranged in the space 17 of the respective frame structure 14. In addition, an aperture 32 is arranged in each side portion 18, 19 of the respective frame structure 14 to make it possible for a driveshaft 33 to extend from the respective wheel 25 through the aperture 32 of the respective side portion 18, 19 to the
- 10 differential gear 31 which is arranged in the space 17 of the respective frame structure 14. A drive connection 34 connects the two differential gears 31.

- Each rear axle unit 13 may incorporate a set of steering gear (not depicted) which makes steering of the wheels 25 of the respective rear axle unit 13 possible via a
- 15 linkage arrangement.

- In Fig. 3, a towbar 35 is directly connected to the second end region 16 of the frame structure 14 via the ends of the side portions 18, 19 in the vicinity of the respective lower sections 22 of the side portions 18, 19. The towbar 35 is designed to make it
- 20 possible to attach a trailer vehicle. The frame structure 14 may also incorporate a coupling device 36 in the form of a turntable on the same side as the towbar 35, as depicted in Fig. 4. Such a turntable is used when a so-called semitrailer which only incorporates a rear axle arrangement is coupled to a truck. As may be seen in Fig. 4, the coupling device 36 replaces the upper portion 20 of the frame structure 14 in Fig.
- 25 3. It should be noted that a rear axle unit need not incorporate both a towbar and a coupling device in the form of a turntable as depicted in Fig. 4 but may incorporate only one of these alternatives. A coupling device 36 in the form of a turntable arranged as depicted in Fig. 4 is used where a rear axle arrangement according to the invention incorporates only one rear axle unit.

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The invention is not limited to the embodiment depicted but may be varied and modified within the scopes of the patent claims below.

Claims

1. Rear axle arrangement (12) for a heavy vehicle (1), e.g. a freight vehicle, with a number of wheels (25) which bear the vehicle (1), the vehicle (1) incorporating an elongate chassis element (5) which extends in the longitudinal direction (x) of the vehicle (1), which rear axle arrangement (12) incorporates at least one separate rear axle unit (13) which includes a load-bearing frame structure (14) and two of said wheels (25), said frame structure (14) extends between a first end region (15) and a second end region (16) in said longitudinal direction (x) and said first end region (15) of said frame structure (14) is designed to be connected to said elongate chassis element (5), and that said two wheels (25) are suspended on said frame structure (14), characterised in that said rear axle unit (13) forms a substantially self-supporting rear axle module and that any desired number, preferably two or three, of such rear axle modules can be connected to one another via said frame structure (14).

2. Rear axle arrangement (12) according to claim 1, characterised in that said frame structure (14) forms a space (17) which extends through the frame structure (14) in said longitudinal direction (x).

3. Rear axle arrangement (12) according to claim 2, characterised in that the frame structure (14) incorporates two side portions (18, 19) which are situated at a distance from one another and extend in said longitudinal direction (x), and said side portions (18, 19) are connected to one another by an upper portion (20) and by at least one lower portion (21, 22) in such a way that said portions (18, 19, 20, 21, 22) form said space (17) between them.

4. Rear axle arrangement (12) according to claim 3, characterised in that said portions (18, 19, 20, 21, 22), as viewed in the longitudinal direction (x) of the vehicle (1), form a substantially quadrilateral frame round said space (17).

5. Rear axle arrangement (12) according to either of claims 3 and 4, characterised in that each side portion (18, 19) has a lower section (23) and an upper section (24) and

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the lower section (23) of each of said side portions (18, 19) is of greater extent in said longitudinal direction (x) than the respective upper section (24).

6. Rear axle arrangement (12) according to any one of claims 3 to 5, characterised in that said side portions (18, 19) are connected to one another by two lower portions (21, 22), the first lower portion (21) is arranged adjacent to the first end region (15) of the frame structure (14), and the second lower portion (22) is arranged adjacent to the second end region (16) of the frame structure (14).

10 7. Rear axle arrangement (12) according to any one of the foregoing claims, characterised in that said two wheels (25) are individually suspended in said frame structure (14).

8. Rear axle arrangement (12) according to claim 7, characterised in that each of said two wheels (25) is suspended by means of a lower link arm (27) and an upper link arm (28) which are pivotingly connected to the frame structure (14).

20 9. Rear axle arrangement (12) according to claims 3 and 8, characterised in that both the lower link arms (27) and the upper link arms (28) are each pivotingly connected to the respective side portion (18, 19).

10. Rear axle arrangement (12) according to claims 3 and 8, characterised in that the rear axle unit (13) incorporates a spring device (30) for each wheel (25), and each spring device (30) is connected to the upper portion (20) of the frame structure (14) and a lower link arm (27).

11. Rear axle arrangement (12) according to any one of the foregoing claims, characterised in that said wheels (25) are powered and a differential gear (31) is arranged in said frame structure (14).

30 12. Rear axle arrangement (12) according to claims 3 and 11, characterised in that said differential gear (31) is arranged in said space (17) and that each of said side portions

(18, 19) incorporates an aperture (32) through which a respective driveshaft (33) extends from the respective wheel (25) to said differential gear (31).

13. Rear axle arrangement (12) according to any of the foregoing claims, characterised in that said rear axle unit (13) incorporates a towbar (35) for attaching a trailer vehicle and that said towbar (35) is directly connected to said frame structure (14).

10 14. Rear axle arrangement (12) according to any one of the foregoing claims, characterised in that said rear axle unit (13) incorporates a coupling device (36) for attaching a trailer vehicle.

15. Rear axle arrangement (12) according to claims 3 and 14, characterised in that said coupling device (36) constitutes said upper portion (20).

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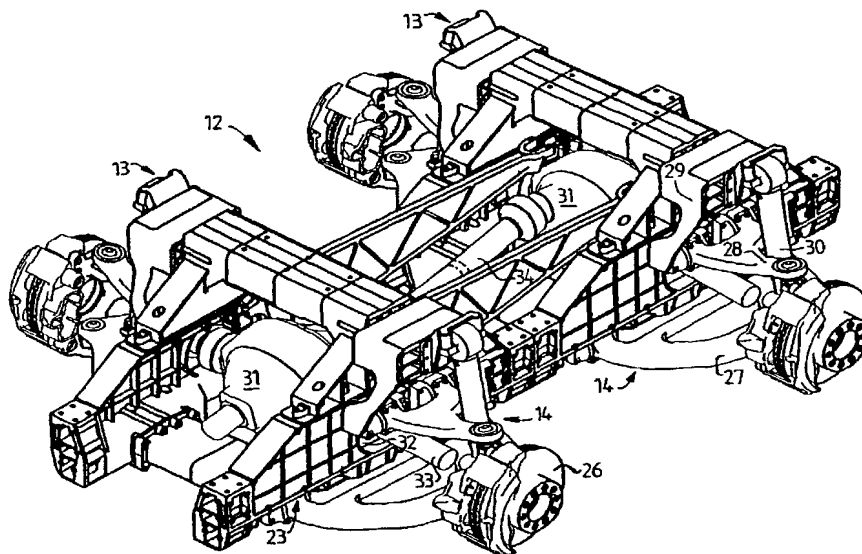
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(54) Title: REAR AXLE ARRANGEMENT FOR A HEAVY VEHICLE



(57) Abstract: The invention relates to a rear axle arrangement (12) for a heavy vehicle, e.g. a freight vehicle. The vehicle incorporates a number of wheels which bear the vehicle and an elongate chassis element which extends in the longitudinal direction of the vehicle. The rear axle arrangement (12) incorporates at least one separate rear axle unit (13) which includes a loadbearing frame structure (14) and two of said wheels. The frame structure (14) extends between a first end region and a second end region in the longitudinal direction of the vehicle and the first end region of the frame structure (14) is designed to be connected to the elongate chassis element. In addition, the two wheels are suspended on the frame structure (14).

WO 01/23244 A1

1/4

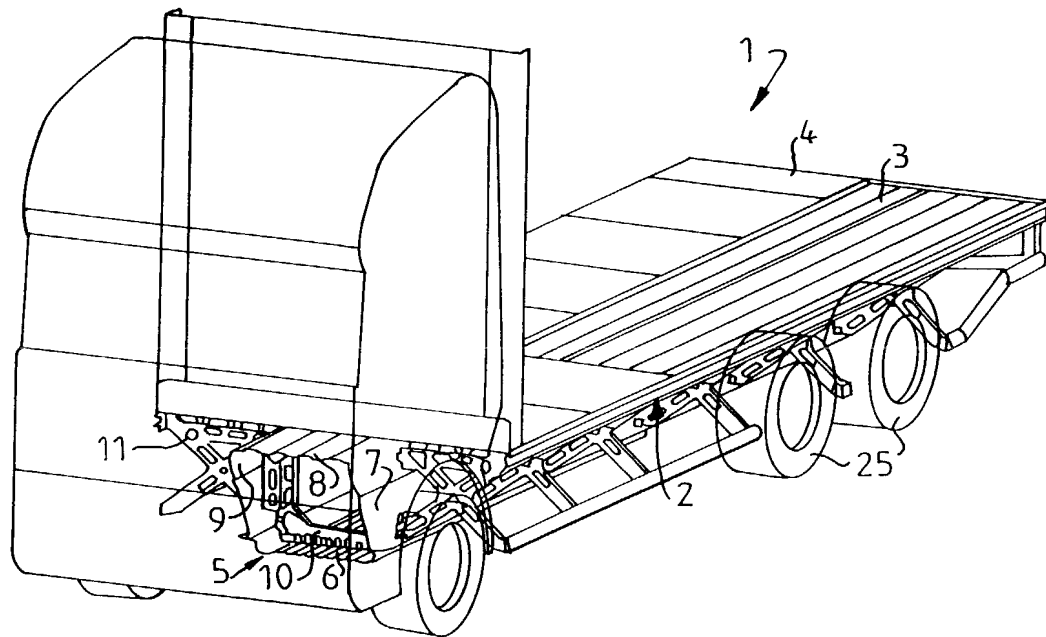
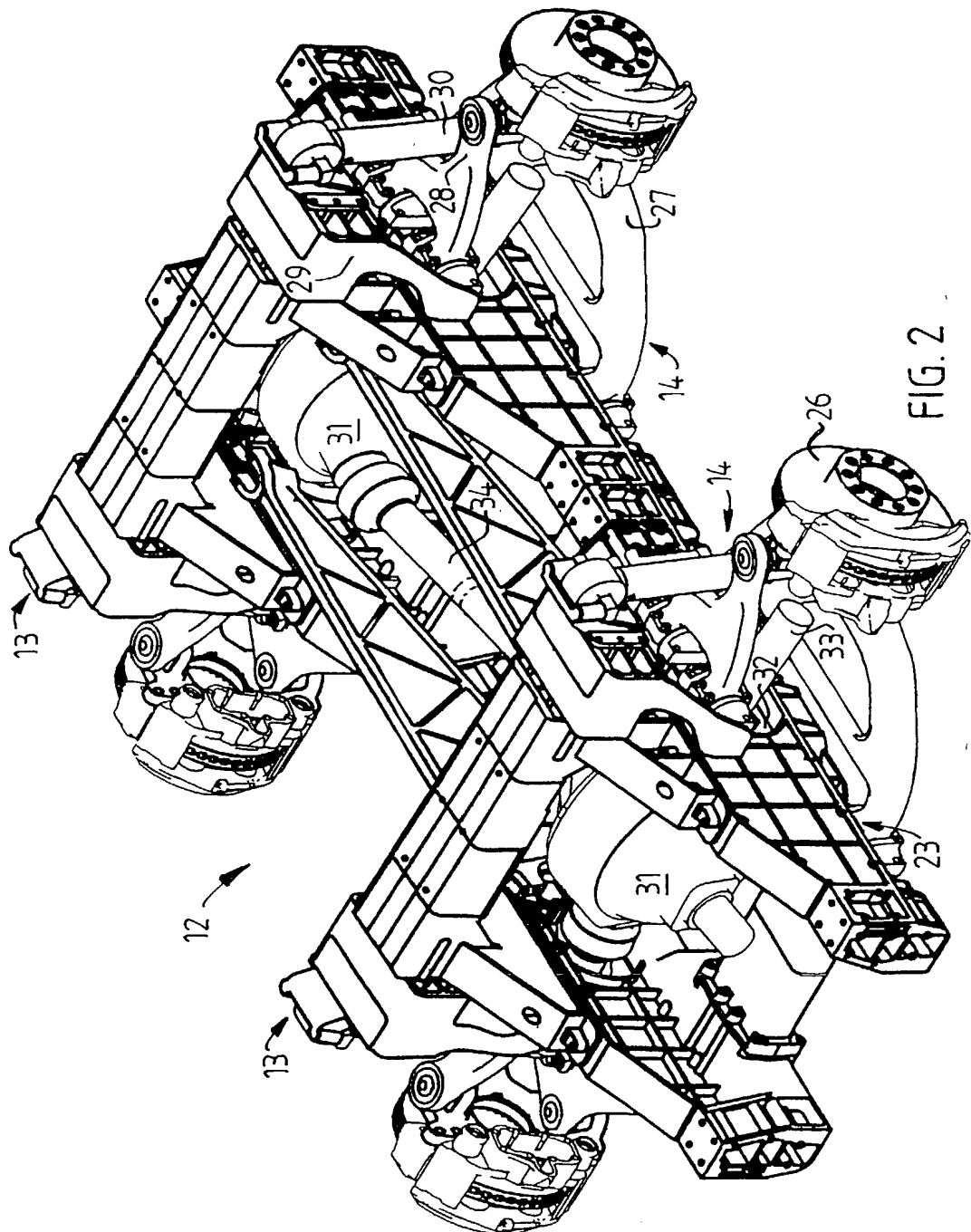


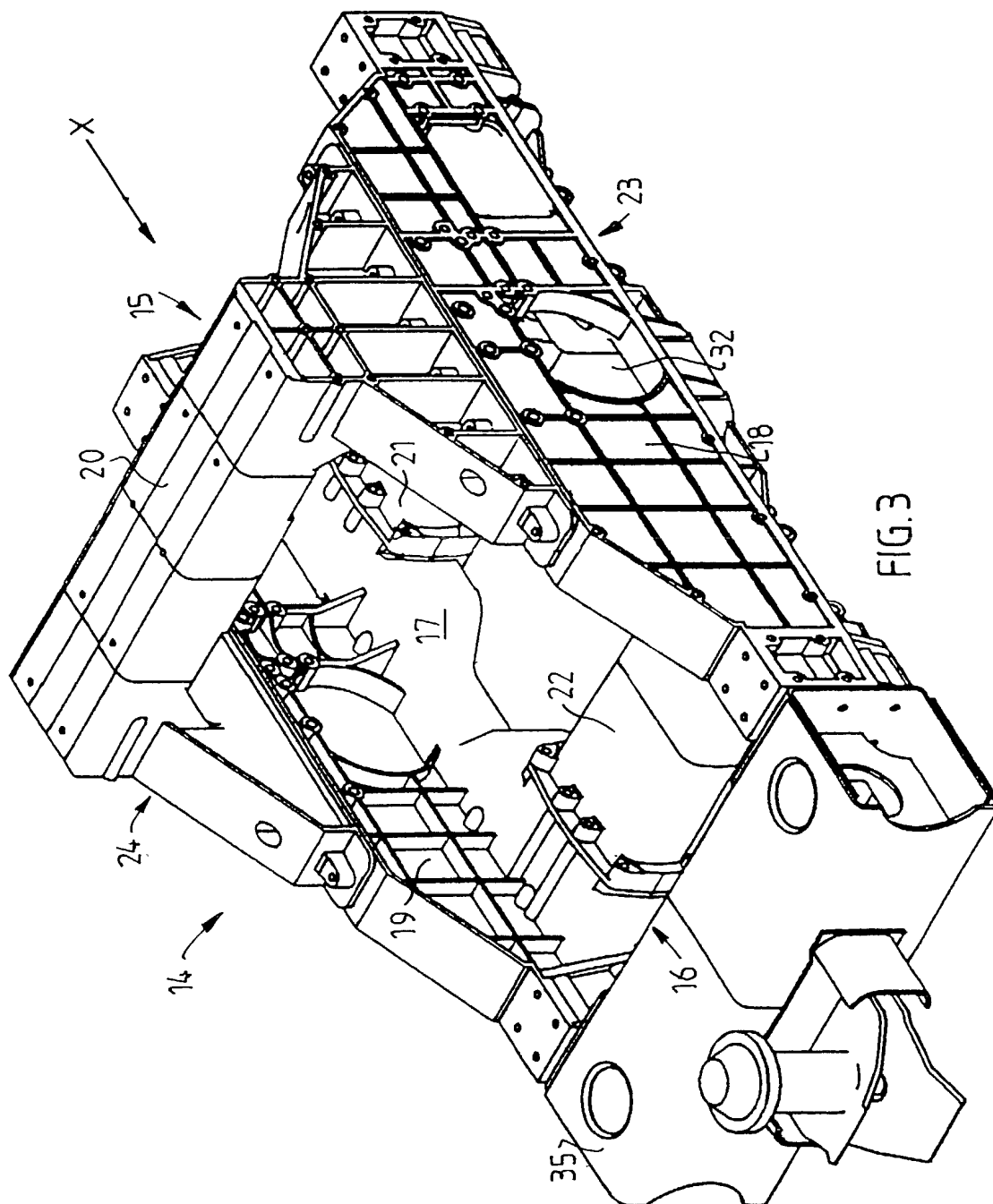
FIG.1

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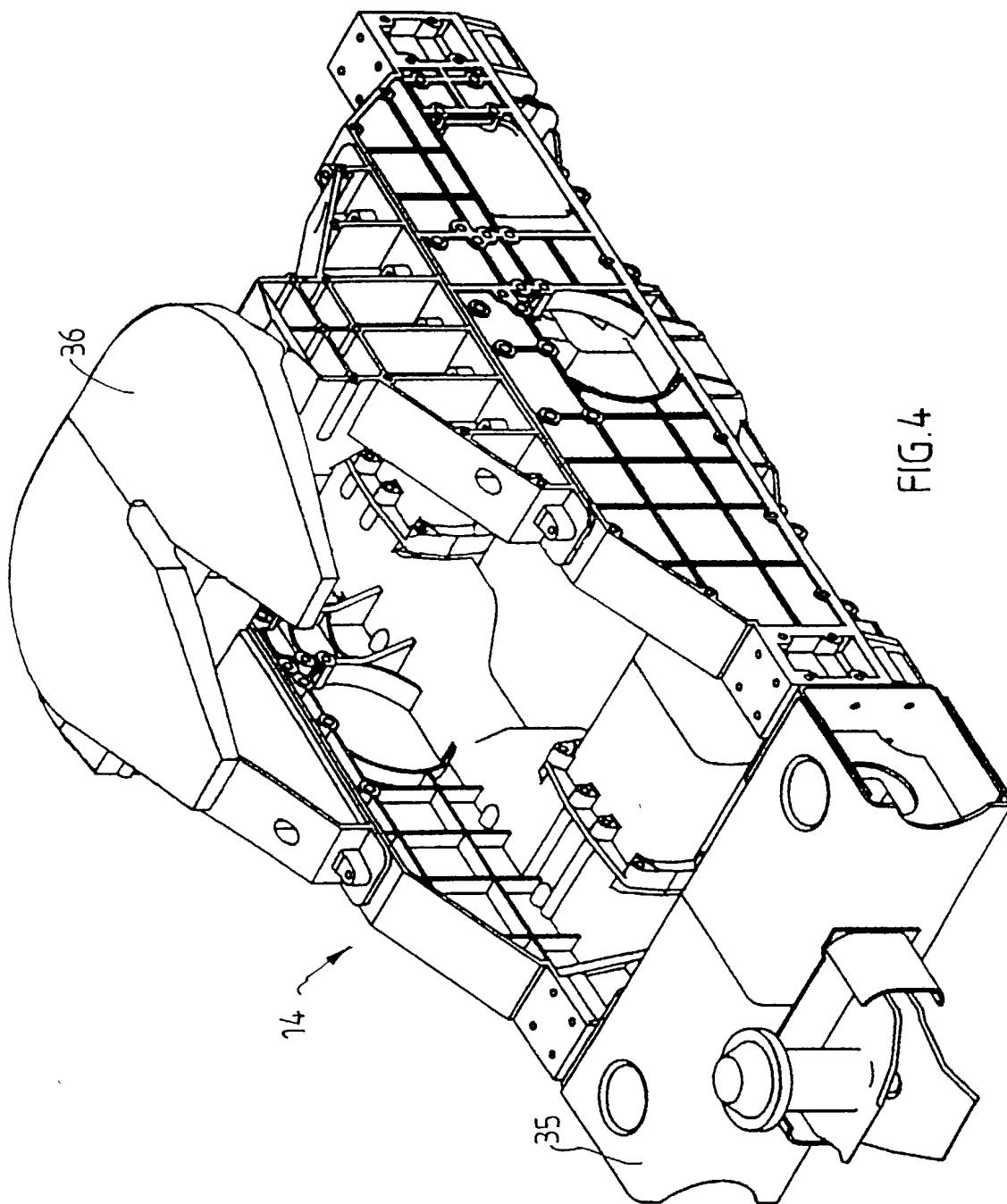
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UNITED STATES OF AMERICA COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION		OFGS FILE NO. P/1228-153																																															
<p>As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <p>Rear axle arrangement for a heavy vehicle</p>																																																	
<p>the specification of which is attached hereto, unless the following box is checked:</p> <p><input checked="" type="checkbox"/> was filed on 28 September 2000 as United States patent Application Number or PCT International patent application number PCT/SE00/01876 and was amended on _____ (if any).</p> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.</p> <p>I acknowledge the duty to disclose all information known to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.</p> <p>I hereby claim priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate or United States provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:</p> <p>Prior Foreign or Provisional Application(s)</p> <table border="1"> <thead> <tr> <th>COUNTRY</th> <th>APPLICATION NUMBER</th> <th>DATE OF FILING (day, month, year)</th> <th>PRIORITY CLAIMED UNDER 35 U.S.C. 119</th> </tr> </thead> <tbody> <tr> <td>SWEDEN</td> <td>9903520-6</td> <td>29 September 1999</td> <td>YES <input checked="" type="checkbox"/> NO <input type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td></td> <td>YES <input type="checkbox"/> NO <input type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td></td> <td>YES <input type="checkbox"/> NO <input type="checkbox"/></td> </tr> </tbody> </table> <p>I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.</p> <table border="1"> <thead> <tr> <th>UNITED STATES APPLICATION NUMBER</th> <th>DATE OF FILING (day, month, year)</th> <th>STATUS (patented, pending, abandoned)</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td></tr> </tbody> </table> <p>I hereby appoint <u>customer no. 2352 OSTROLENK, FABER, GERB & SOFFEN, LLP</u>, and the members of the firm, Samuel H. Weiner - Reg. No. 18,510; Jerome M. Berliner - Reg. No. 18,653; Robert C. Faber - Reg. No. 24,322; Edward A. Meilman - Reg. No. 24,735; Steven I. Weisburd - Reg. No. 27,409; Max Moskowitz - Reg. No. 30,576; Stephen A. Soffen - Reg. No. 31,063; James A. Finder - Reg. No. 30,173; William O. Gray, III - Reg. No. 30,944; Louis C. Dujmich - Reg. No. 30,625; Douglas A. Miro - Reg. No. 31,643, and Michael J. Scheer - Reg. No. 34,425, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.</p> <p>SEND CORRESPONDENCE TO: OSTROLENK, FABER, GERB & SOFFEN, LLP DIRECT TELEPHONE CALLS TO: (212) 382-0700 1180 AVENUE OF THE AMERICAS NEW YORK, NEW YORK 10036-8403 CUSTOMER NO. 2352</p> <p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p> <table border="1"> <tr> <td>FULL NAME OF SOLE OR FIRST INVENTOR Ake BERGSTROM</td> <td>INVENTOR'S SIGNATURE <i>Ake Bergstrom</i></td> <td>DATE April 16, 2002</td> </tr> <tr> <td colspan="2">RESIDENCE (City and either State or Foreign Country) SE-647 31 Mariefred, SWEDEN SEX</td> <td>COUNTRY OF CITIZENSHIP SWEDEN</td> </tr> <tr> <td colspan="3">POST OFFICE ADDRESS Slottsbrinksvägen 9, SE-647 31 Mariefred, SWEDEN</td> </tr> <tr> <td>FULL NAME OF SECOND JOINT INVENTOR (if any) Pär WALLIN</td> <td>INVENTOR'S SIGNATURE <i>Pär Wallin</i></td> <td>DATE April 16, 2002</td> </tr> <tr> <td colspan="2">RESIDENCE (City and either State or Foreign Country) SE-153 00 Järna, SWEDEN SEX</td> <td>COUNTRY OF CITIZENSHIP SWEDEN</td> </tr> <tr> <td colspan="3">POST OFFICE ADDRESS Fredriksberg, SE-153 00 Järna, SWEDEN</td> </tr> </table>				COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119	SWEDEN	9903520-6	29 September 1999	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>				YES <input type="checkbox"/> NO <input type="checkbox"/>				YES <input type="checkbox"/> NO <input type="checkbox"/>	UNITED STATES APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)										FULL NAME OF SOLE OR FIRST INVENTOR Ake BERGSTROM	INVENTOR'S SIGNATURE <i>Ake Bergstrom</i>	DATE April 16, 2002	RESIDENCE (City and either State or Foreign Country) SE-647 31 Mariefred, SWEDEN SEX		COUNTRY OF CITIZENSHIP SWEDEN	POST OFFICE ADDRESS Slottsbrinksvägen 9, SE-647 31 Mariefred, SWEDEN			FULL NAME OF SECOND JOINT INVENTOR (if any) Pär WALLIN	INVENTOR'S SIGNATURE <i>Pär Wallin</i>	DATE April 16, 2002	RESIDENCE (City and either State or Foreign Country) SE-153 00 Järna, SWEDEN SEX		COUNTRY OF CITIZENSHIP SWEDEN	POST OFFICE ADDRESS Fredriksberg, SE-153 00 Järna, SWEDEN		
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<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>			
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